UEC request for Aquifer Exemption

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Philip,
see attached summary of Mr. Van Kelly's testimony during the TCEQ hearing on the application for a permit to mine uranium in Goliad County.
I have cited my summary statements to the appropriate pages of this testimony. If you do not have this testimony, let me know and I will send you a copy.
If you have any questions, feel free to call me at 281-455-7886.
Lawrence G. Dunbar, P.E.

SUMMARY OF TESTIMONY OF VAN KELLY AT TCEQ HEARING.doc

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SUMMARY OF TESTIMONY OF VAN KELLY AT TCEQ HEARING ON UEC

1. Van Kelly developed a groundwater flow model of the B sands which formed the basis of his testimony and opinions for UEC in this case. [pg. 548 of hearing transcript]. **He also stated that the GW model was developed for use in support of the aquifer exemption request to be made to the EPA. [pg. 564]**

GW Model Development

2. His B Sands model was bounded on the northwest and southeast sides by the 2 major faults. [pg. 563]
3. The B Sands model covers an area of about 4000 feet by 6000 feet, and is made up of about 100,000 columns with 10 layers per column, for a total of about a million cells to represent the B sand layer of the Goliad aquifer; the uppermost layer represents the clay layer between the A & B sands, and the lowermost layer represents the clay layer between the B & C sands. [pgs. 576-577]
4. He doesn't know how the sand is actually distributed vertically in the B Sands (versus the clay/silt lenses), even though he does change the percent of sand in each of the 10 layers in each column in the model. [pgs. 598-599]
5. Resistivity curves show the sand versus clay in each boring log, and vary from boring log to boring log due to **the significant heterogeneity of the site; he notes that this heterogeneity of the site is "the hydrogeologic problem right there." [pgs. 609-610]**
6. Once the information for the cells where boring logs exist is developed for those cells, the model linearly interpolates to create the information for all of the remaining cells in the model. [pg. 611] This is his "best guess' at what the geologic makeup is between boring logs, using linear interpolation. [pg. 612]
7. He did not independently verify the percentage of net sand for each boring log that he used to create that information for the cells where there were boring logs, he just used what was given to him by UEC. [pgs. 612-613]
8. He used the single-well pump tests to get the initial hydraulic conductivity values for the cells where the wells are located, then used this parameter to help in the calibration process. [pgs. 617-618]
9. He assumed that the test results were reflecting the hydraulic conductivity of the sand only, so he used that value for that portion of the cell that was assumed to be sand. For the remaining portion of each cell that was assumed to be clay/silt, he used a different hydraulic conductivity value to then arrive at a composite value for each cell. [pgs. 619-621]
10. He used the long-term pump test to measure an <u>average</u> hydraulic conductivity on a bulk scale, then checked that number during calibration so that the GW model's <u>average</u> hydraulic conductivity was "in the same ballpark". [pgs. 624-625]
11. He used the long-term pump test to get an average storativity value that he applied to all of the cells without distinguishing between any difference between sand and clay, or the percentage of each, in any cell. [pg. 626]

12. He acknowledged that the CAPTURE ZONE of a well will be impacted and/or influenced by any inflowing or outflowing water in the area. [pgs. 628-630]
13. He noted that the well screens for the BMW wells were not across the entire thickness of the sand layer. [pg. 633] The B Sand layer is about 50 feet thick, on average, and the length of the screens in the BMW wells were between 5 feet and 20 feet; and that this does make a difference in how pump test results should be interpreted. [pg. 634] **Also, he recognized that there is a chance that some migration of contaminants can be missed by such screened BMWs. [pg. 719-20]**
14. Since this is a heterogeneous condition in the B Sand layer, the screen length can make a difference, which is primarily why he divided up each column in his model into so many layers since the screening for the pump tests did not completely go across the entire B sand. [pg.635]
15. He acknowledges that the model indicates quite a heterogeneous system, since every single cell has different numbers for the various properties involved. [pg. 640] **He also agrees that there is both vertical and horizontal heterogeneity in the B Sand. [pg. 645]**
16. In his GW model of the B Sand, he assumed that the NW fault acted as a complete barrier to flow, and at least within the permit boundary, he kept the NW fault closed to any flow-thru. [pg. 657] Outside the permit area towards the southwest, he let some water through in the vicinity of this NW fault, since **he had some question as to whether the fault was there or not. [pg. 658] He stated "the Northwest fault is an interesting situation." [pg. 665]**
17. **However, according to Craig Holmes Exhibit 14, the Southeast fault extends further than where the model shows it to end, and the NW fault extends further than where the model shows it to end. [pg. 663]**
18. He noted that he had some water level values to use as boundary conditions near the NW fault, but **he had to assume water level values to use as boundary conditions for the Southeast fault. [pgs. 669-670]**

<u>Calibration of the GW Model</u>

19. He said he calibrated his model to 3 periods: (1) steady-state conditions based on some water level measurements taken from Sept. 30- Oct. 1, 2008; (2) PTW-6 pump tests; and (3) PTW-1 pump tests. {pgs. 674-675]
20. **For the steady-state/ambient conditions, the available water level data was within the PA-1 area and at the BMW wells surrounding it; but he had very little data for the rest of the model area so he looked at the GW flow gradient in the PA-1 area to get a feeling for what the flow gradient should look like for the rest of area. [pgs.677-678]**
21. **<u>His model shows GW direction is West to East</u>, at a gradient of about 1 foot per 1000 feet; <u>whereas figures in the UEC Permit Application show that for the western one-third of the PA-1 site, the GW direction is to the West and/or South</u>**; two Figures 5-3 show piezometer contours for the B Sand, one dated Feb. 17, 2009 and another dated Aug. 25, 2008. [pgs. 682-685] **[NOTE: THESE**

TWO FIGURES WERE PROVIDED TO THE EPA IN A BLACKBURN CARTER LETTER DATED SEPT. 26, 2011 ATTACHED AS EXHIBIT 3]

22. He believes that his calibration data is more representative of real conditions because the data in the Figures 5-3 "looks like it's been influenced by something." [pg. 686] Yet, his calibration data that he used was not provided in the application nor in his pre-filed testimony. [pg. 687] His calibration results are also not in the application nor in his pre-filed testimony. [pg.700] **[NOTE: WE HAVE BEEN UNABLE TO VERIFY CALIBRATION DATA OR RESUTLS FOR THIS MODEL]**
23. He states that his model matched drawdowns shown from the long-term pump tests, yet drawdowns were only 2 feet or less, and he acknowledges that the model fit responses from the PTW-6 test "generally" throughout the well field "in most cases". [pgs. 695-6 and 698]
24. He states that his model matched the <u>changes</u> in drawdown, but no information was provided as to how well his model matched the <u>actual</u> water levels. [pg. 699]

<u>GW Flow Direction</u>

25. **His opinion that the groundwater flow direction with the graben is "generally" to the east is based on his model and his calibration data within the PA-1 area. [pg. 703]**
26. He notes that his GW gradient within the graben per the model is relatively small compared to the GW gradient outside the graben. [pg. 705]
27. Within the graben, his GW gradient is such that GW moves about 19 feet per year towards BMWs. [pg. 720] During mining production, however, he acknowledges that the gradient may become steeper. [pg. 721]
28. He notes that a nearby well pumping outside the permit boundary could influence the hydraulic gradient occurring inside the permit boundary depending on how close it is and how much pumping it has. [pg. 729] He believes that upgradient wells would have less impact than downgradient wells; and he would not like any such pumping to be occurring in the vicinity of the BMWs. [pg. 730]
29. He acknowledges that if boreholes were left open and not plugged, then migration could occur. [pg. 766]
30. He also acknowledged that his model did not reproduce the drawdown curve seen during the pump test at BMW-7; he ignored that data at the time since he assumed it was a data problem, yet never investigated it to explain the reason why it was behaving that way.. [pgs. 768, 771-72] **[NOTE: THIS BMW-7 IS ALSO WHERE THE HIGH WATER LEVEL IS GENERALLY LOCATED IN THE FIGURES 5-3 SHOWING MEASURED WATER LEVELS AND GW FLOW DIRECTION TOWARDS THE WEST AS WELL AS THE EAST]**